

manion, and this figure was taken out of a pond belonging to it in the time of Charles the Second; the head was broken off in the frost of 1745.

The Norman conquest established a purely military despotism, under which there was no scope for manifestation of the wilder feelings in the erection of monuments; the few of the Saxon or mixed race who were still permitted to hold lands could not tell how long these possessions would remain to themselves or families; immense fiefs or baronies were consolidated, and put into the hands of the Norman leaders, who in several instances, as proved to us by Domesday Book, held thirty or forty manors. At that period of above the lowest rank were soldiers, and the sword alone constituted the gentleman; existing monuments of a corresponding date are therefore confined to kings, their families, and a few of the chief nobility and leaders, among which the most ancient are those of Gundred, niece of the Conqueror at Lewes, William de Eilcourt at Lincoln, Bishop Roger at Salisbury, and of the Verres, Earls of Oxford, at Evesham, Essex. The rule of the "strong hand," which especially characterised succeeding monarchs of the Norman line, and became even more oppressive during the struggle between Stephen and his contending barons, gave little encouragement to monumental sculpture, beyond examples similar to those already cited; but in the interval between the ninth year of the following reign (Hen. III.) to the tenth of Edward II., or from 1224 to 1316, a new occasion and style occurs in monuments of the Knights Templars, a religious order of laymen who had fought for the recovery of Palestine, and of a secondary class who had vowed and performed a pilgrimage to the Holy Land. This once powerful body, whose self-devotion was cherished and applauded throughout Christendom, grew immensely rich, and the obsequies of their dead were celebrated with little less than regal pomp; in contradistinction to the current practice of interring the remains of the great in abbey churches, the templar appears to have chosen, or his remains to have been claimed by the church of which he was the immediate patron, as well as lord of the surrounding domain, and to have conferred both sanctity and dignity upon the locality of his final repose. The Templars were usually, if not universally, buried cross-legged, in token of the banner under which they had fought, and completely armed; we may conclude that all such effigies, whether in niches, or in walls, or on table tombs, in decorated armour with a shield on the left arm, and the right hand grasping the sword, cross-legged, and with the feet resting on a lion, talbot, or other animal, are of the date set forth.

About the middle of the reign of Edward III., estates and lands came to be more divided, and the possessors tranquilly settled upon them; again the memory of progenitors was cared for, many ecclesiastical buildings were raised, and resting places with memorials congenial to the devotional spirit of the time were provided. About 1350 came in the table tomb, with figures recumbent upon it, the hands joined in a praying posture, frequently surrounded by a rich canopy of stone; round the edges of these tombs, for the most part, were inscriptions on brass plates. The more humble gravestone laid flat on the pavement had sometimes an inscription cut round the border, and enriched with plates of brass; most of these stones have been despoiled of the brasses which adorned them. Could the scourges of fanaticism and plunder have been averted, these memorials were well calculated to preserve the memory of the dead; brasses, in many instances, have served to hand down names and incidents through the generations of six hundred years; their great offence to Puritan eyes was the simple yet devout request that all who read would pray for the deceased, and that God would have mercy upon his soul; leaving it to be inferred that however elevated in life, he was in other respects but as ourselves. From about the year 1380 this mode of commemoration grew into common use, and remained so even to the time of James I.; but after the reign of Edward VI. we find the old square Gothic letter abandoned for the Roman capital, and the phrase *pro anima* omitted.

(To be continued, with illustrations of unpublished monuments.)

ON THE CONSTRUCTION OF ARCHES.

WHILE thousands of arches are annually turned in this country by bricklayers and masons, while the joiner is perpetually employed in framing casements for windows, and the general architect is daily projecting new models for buildings, mathematicians have tormented themselves in vain in pursuit of the best form of an arch. We have equations in curves presented to us, which are to produce wonderful effects, but unfortunately, as they arise from the consideration of first and second fluxions, the practical builder understands nothing of the demonstrations; and if he did, the difficulties in the way of forming the frame for the required curve would ruin all his scientific preconceptions. How then is it, that bridges are actually built, that they remain firm, and support immense weights? How is it that they are built by the most ordinary bricklayer; that a frame, united in the rudest manner, should prove adequate to its purpose? That scarcely any skill is necessary in forming the bricks to a particular standard? These questions, if they had occurred to the mathematicians who were composing their "principles of bridges, containing the mathematical demonstrations of the properties of the arches," might have led them to contemplate the curve of the arch as of little importance, and to conclude that the theory of circular buildings depended upon other and very different qualities in their structure.

In glancing at the windows of every house, the arches of every bridge, or the entrances of every church in this vast metropolis, what is it that particularly strikes the eye in the position of the stones or bricks which form an unsupported curve? We see them placed differently from all the rest, and perceive that the centre stone or brick is the segment of an equilateral wedge, the stones or bricks adjoining them being also segments of wedges.

The theory of arch-building being thus deduced from the nature of the wedge, the equilibrium of arches is established either by adjusting the weights of the sections, according to the angles which are contained between their sides, supposed to be given quantities, or by supposing the weights of the wedges or sections to be given, and investigating what must be the angles contained by their sides; so that the pressures on them may be an exact counterpoise to the weight of each section, due regard being had to its place in the arch. The wedges are considered as perfectly hard bodies, independent of each other, and as acting solely by their own gravity, without cement or other fastenings. Thus, if we suppose a certain number of these segments of wedges placed in the form of an arch, or united in a straight line as our bases, as generally occurs at the tops of our windows, the weight of each section, by which it endeavours to descend towards the earth, is opposed by the pressure the sides of it sustain from the sections which are adjacent to it. If the pressure should be small, the wedge will not be supported; but will descend with greater or less obliquity to the horizon, according to its place in the arch. If the pressure should be too great, it will more than counterpoise the weight of the section, and will force it upward. The equilibrium of the entire arch will consequently depend on the exact adjustment of the weight of each section or wedge to the pressure it sustains, and the angular distance from the vertex.

Let us suppose an arch to be completed; let us next remove all the stones from one side, and apply a prop perpendicularly to the side of the key-stone, so that such prop shall as effectually support it, and, of course, the remaining part of the arch, as if none of the stones had been taken away. In this case, the existing side of the arch will be immovably fixed, and the key-stone be prevented from falling, by the resistance of the prop on the one side, and the abutment of the base of the arch on the other. Half, therefore, of the weight of the key-stone will be supported by the prop, and half by the abutment. From the principles of the wedge, the half weight is to the resistance, or to the action of the prop, as the sine of half the angle of the wedge to radius, the angle of the wedge being the angle which the sides of the key-stone form, when they meet by subtraction. Hence the weight of the key-stone, and the angle of the wedge being given, the resistance of the prop is found.

Let us now suppose, that the stone next to

the key-stone, of which it made the abutment, is also removed, and that the remaining part of the arch is permanent; the prop, in this case, will not be efficacious, unless the key-stone, and that adjoining, be properly adjusted; and, to make this adjustment, we must have the weight of the key and the adjoining stones given, and also the angles of the wedges. The resistance of the prop, which acted perpendicularly to the side of the key-stone, being increased by the action of the latter, is to be resolved into two sections, the one perpendicular to the new abutment, and the other parallel to it; the latter being the efficacious part of the resistance to prevent the descent of the stone in the direction of the abutment. In the same manner, the second to the key-stone is to be considered as movable, and so on; and, by a very elegant construction, the weights of each successive stone are determined; and the prop being taken away, and an arch similar to that on the other side of the key-stone substituted in its stead, the whole becomes an arch of equilibration. C. R.

YORK MINSTER.—Three massive doors have just been completed in Newcastle for York Minster. They are of the decorated or Christian style, and designed by Mr. Sidney Smirke, under whose direction the restoration of that splendid Minster is now drawing to a close. The three doors are alike, and measure 16 feet in height, and 64 feet in breadth. The upper part is full of rich tracery, supported by columns with capitals, embellished with Gothic leaves. The tops of the capitals are ornamented with figure-heads, out of which the hood mouldings spring, and terminate with exquisitely carved Gothic finials and crockets. In the centre of the arches are three trefoils, with shields, on which coats of arms may be put. The lower part of the door is divided into six portions or arcades, the tops of which are decorated with crockets and finials, and between each compartment are beautifully carved pinnacles, springing from the heads of the columns. They have been executed by Mr. James Wallace, builder, and Mr. R. J. Scott, carver, and their elegant workmanship has been admired by all who have seen them.—*Newcastle Paper.*

REFORM CLUB.—On Monday evening at seven o'clock a trial was made between the celebrated inventors—the Bude and Faraday lights. Aired for that purpose in two of the libraries of the Reform Club. There were present Sir H. Webb, Bart., Captain Duran, Mr. Faraday, Mr. Barry, Sir A. Colebrook, Sir J. Duran, Dr. Holland, Mr. Nance, F.R.S., and many gentlemen connected with the club. The result of the experiment was in favour of the Bude light as to the brilliancy of illumination, the perfect ventilation, and the freedom from heat. The Bude gives a light equal to 30 argands, and lights the room perfectly at every point. The Faraday light consists of 18 lights, and the smoke of the gas is carried off by tubes. The heat increased six degrees after the Faraday was lighted, and it is of a subdued tone and far from brilliant. It will thus be seen that the Bude has added to its fame by these experiments, the more by reason of both lights being great improvements upon the old system. The Bude, we believe, has been quietly but rapidly gaining in public estimation, and to the many public and private edifices which now possess it, the principal claim will, doubtless, soon be added. During the experiment it was stated that the Faraday light was about four times more expensive than the Bude.—*Times*, Nov. 8th.

THE PLYMOUTH BREAKWATER.—The last stone of the lighthouse tower, at the western end of this stupendous sea-battery, was set on Thursday last by the Rear-Admiral Superintendent of the dockyard, Sir Samuel Pim, K.C.B., who proceeded to the spot, accompanied by his secretary, Mr. Dent, and his flag-lieutenant, Mr. Potbury. Captain Miles, of the Calcutta, 120, was also present. The tower is 122 feet in height from the level of the bottom of the sea, and 56 feet from the level surface of the breakwater. It is composed of 31 courses of large blocks of dressed granite, the first of which was laid by the late superintendent of the dockyard, Vice-Admiral Warren, on the 22nd of February, 1841. The lighthouse is divided into five stories, in which are 30 oil-rooms, a store-room, a dwelling-room, a land-robin, and a watch-room. It has fourteen windows, seven of which are in the watch-room, the frames being constructed of bell-metal, as are also the pater doors. The lantern is the only thing now necessary to complete it for service, which it is expected will be ready to be brought into use early in the next year, when it will supersede the old light vessel, which has been moored in the Spanish cove since 1813.